Available online at : http://journal.unj.ac.id/unj/index.php/gjik
Gladi : Jurnal Ilmu Keolahragaan, 16 (04) 2025, 607-615
Permalink/DOI: https://doi.org/10.21009/GJIK.164.12

Sleeping Late at Night: Does it Affect the Performance of Futsal Athletes?

Wahyudi Widada[1] and Ahmad Sulaiman[2]

[1]D3 Nursing Study Program, Faculty of Health Sciences, Universitas Muhammadiyah Jember, Indonesia
[2] S1 Physical Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Jember, Indonesia

Correspondiing author. Email**:** wahyudiwidada@unmuhjember.ac.id

(Submission Track: Received: 06-04-2025, Final Revision: 24-10-2025, Available Online: 31-10-2025)

Abstract. Adequate sleep is crucial for optimal physiological and physical performance in athletes. This study aims to examine the effects of late-night sleep on cardiovascular responses and fitness levels among futsal athletes at the Muhammadiyah University of Jember. Using a pre-experimental design, ten athletes from the university's futsal unit were purposively selected as participants. Measurements of systolic and diastolic blood pressure, heart rate, and cardiorespiratory endurance (VO_2Max) were conducted before and after a three-day period of restricted sleep. Data were analyzed using the Wilcoxon and paired t-tests. The findings revealed significant increases in systolic and diastolic blood pressure as well as heart rate after the sleep deprivation period, accompanied by a significant decrease in VO_2Max scores ($p = 0.021$). These results indicate that late-night sleep negatively affects athletes' fitness by elevating cardiovascular strain and reducing aerobic capacity. The study emphasizes the importance of maintaining proper sleep hygiene as an essential recovery component in athletic training programs to sustain endurance, optimize performance, and prevent fatigue-related declines.

Keywords: sleep deprivation; futsal; VO_2Max; physiological response; athlete performance

INTRODUCTION

Sleep is a fundamental biological process that plays an essential role in maintaining homeostasis, restoring energy, and ensuring optimal recovery of physiological functions. It is not only a passive state of unconsciousness but an active process in which metabolic activities, hormonal regulation, and cellular repair occur (Kazemizadeh & Behpour, 2021). For athletes, sleep serves as one of the most critical recovery strategies alongside nutrition and training. Poor sleep patterns, particularly insufficient duration and quality, have been consistently linked to reduced physical performance, impaired concentration, and increased injury risk (Liew & Aung, 2021; Tobaldini et al., 2017).

The relationship between sleep and athletic performance has attracted attention in the sports sciences because sleep directly influences cardiovascular function, metabolic balance, and muscle recovery (Chennaoui et al., 2014). Physiological changes during sleep include decreases in heart rate, arterial blood pressure, body temperature, and increased secretion of growth hormones—all of which are vital for muscle repair and energy replenishment (Carreras et al., 2014). Conversely, insufficient or disrupted sleep can increase sympathetic nervous system activity, elevate cortisol and catecholamine levels, and ultimately reduce cardiovascular efficiency (Rao et al., 2015). Several studies highlight the impact of sleep deprivation on cardiovascular performance. (Kendzerska et al., 2014) found that individuals with chronic sleep disorders experienced significant alterations in cardiovascular regulation, including increased risk of hypertension and arrhythmias. (Chennaoui et al., 2014) reported that even acute sleep deprivation induces higher blood pressure and pulse rate, indicating that inadequate rest contributes to cardiovascular strain. These findings are crucial because cardiovascular endurance is the foundation of stamina in sports, especially in high-intensity activities like futsal.

Short sleep duration (<7 hours per night) has been associated with increased allostatic load, sympathetic nervous system overactivation, and metabolic imbalance (Luthfi B et al., 2017). Furthermore, prolonged inadequate sleep contributes to structural adaptations such as arterial stiffness and left ventricular hypertrophy, leading to long-term cardiovascular risk (Sunbul et al., 2014). This evidence emphasizes that sleep is not only about recovery but also a determinant of cardiovascular health and endurance capacity.

Physical fitness encompasses multiple components, including cardiorespiratory endurance, muscular strength, flexibility, and body composition. Among these, cardiorespiratory endurance is often considered the most important indicator of overall fitness because it reflects the efficiency of the heart, lungs, and circulatory system in delivering oxygen to working muscles (Febrianta, 2015). The quality and quantity of sleep have been shown to correlate positively with physical fitness levels. For example, (Safaringga & Herpandika, 2018) found that students with good sleep quality demonstrated higher levels of physical fitness compared to those with poor sleep quality. Similarly, (Putra & Kriswanto, 2019) highlighted that inadequate sleep interferes with recovery processes and reduces cardiorespiratory endurance.

Futsal is a dynamic, intermittent, high intensity sport characterized by rapid sprints, frequent accelerations and decelerations, quick changes of direction, and repeated bouts of explosive activity over short distances (Naser et al., 2017). These demands are performed throughout two nominal halves of 20 minutes each, making cardiovascular endurance, speed, agility, and rapid decision-making under pressure indispensable for sustaining performance (Pereira et al., 2025). Elite futsal players typically perform at about 85% of their maximal heart rate and approximately 80% of VO_2max during match-play, with performance declining as the game progresses (Spyrou et al., 2020). Studies on futsal athletes have consistently shown that VO_2max is a key determinant of performance. Players with higher VO_2max are able to sustain high-intensity efforts longer and recover more effectively between sprints (Sarfriyanda et al., 2015). Conversely, any factor that reduces VO_2max such as inadequate sleep can compromise performance, leading to decreased stamina, slower recovery, and reduced competitive advantage.

This situation is particularly concerning for futsal athletes in universities, who are not only required to maintain academic performance but also expected to achieve optimal athletic performance in competitions. The double burden increases the risk of sleep deprivation and its subsequent impact on physical fitness. Although numerous studies have explored the physiological mechanisms of sleep deprivation and its association with general health outcomes such as cardiovascular disease, obesity, and diabetes (Frenda & Fenn, 2016; Tobaldini et al., 2017), fewer studies have directly examined the effect of sleep patterns on athletic performance, particularly in university futsal athletes.

To date, there is limited evidence on how late-night sleep specifically affects VO_2max and stamina in futsal athletes. Understanding this relationship is important because VO_2max is directly linked to cardiorespiratory endurance, which determines athletes' ability to perform consistently during matches. Addressing this gap is essential for designing effective training and recovery strategies in futsal. This study aims to analyze the physiological response of futsal athletes to late-night sleep patterns, particularly focusing on cardiovascular parameters (systolic and diastolic blood pressure, pulse rate) and VO_2max as indicators of stamina.

METHOD

The research method used is Pre-experimental design, which is a design that includes only one group given pre and post-test. This design was performed on a single group without any control groups or comparators. The population is futsal athletes who are in the UKM Soccer Unmuh Jember. Using purposive sampling, 10 athletes were obtained (because some resigned, there were 9 athletes). The research instrument of this study uses Multistage Fitness Test (VO2MAX) or bleep test. Volunteers were checked for stamina using the Multistage Fitness Test (VO2MAX) before and after treatment in the form of sleeping late at night for 3 days. Sleeping late at night for three consecutive days only delayed bedtime, meaning that participants slept after midnight. The study did not use objective tools such as actigraphy and did not consider other factors that could have an impact, which limits its validity. Volunteers were checked for Systolic (S), Diastolic (D), Pulse (N) and Stamina (VO2MAX) before and after the VO2MAX physical test. The measurement data were analyzed using the t test. Factors that affect sleep and stamina were not controlled by the study subjects.

RESULT AND DISCUSSION

Table 1. Frequency Distribution of Measurement Results

Variabel	N	Pretest	Posttest	Student t	df	P value	Side effect
Systolic	9	116.7 ± 6.2	125.6 ± 6.7	-3.10	8	0.015	-1.03
Diastolic	9	75.7 ± 4.6	72.8 ± 8.1	0.923	8	0.383	0.308
Pulse	9	70.9 ± 9.9	77.4 ± 14.5	-1.58	8	0.154	-0.525
VO2Max	9	41.1 ± 6.5	36.8 ± 4.5	2.82	8	0.021	0.939

The results of descriptive statistics show that the average systolic post-test is greater than the pre-test, which is 126 compared to 117. The results of the t-test showed a significant difference between systolic blood pressure before and after sleeping late at

night, with a p value = 0.015. These results showed that systolic blood pressure before and after the intervention (late night sleep) was statistically significant. Effect size indicates how large the magnitude of the effect/difference from the observed variables/groups/interventions. In other words, clinically we can conclude that the difference or relationship between the two variables has a significant impact, although it is also necessary to consider the context and implications of the findings.

The results of the t-test showed no significant difference between diastolic blood pressure before and after a late night's sleep (p = 0.383). These results showed that diastolic blood pressure before and after the intervention (late night sleep) did not differ statistically. The effect size value of 0.308 is categorized as a small to medium effect. This means that practically/clinically the difference between the two is very small. The results of descriptive statistics show that the average post-test pulse is greater than the pre-test, which is 77.4 compared to 70.9. The results of the t-test showed no significant difference between diastolic blood pressure before and after a late night's sleep (p-value = 0.154). These results showed that diastolic blood pressure before and after the intervention (late night sleep) did not differ statistically. The effect size value of -0.525 is categorized as a medium effect. This means that practically/clinically the difference between the two is in the intermediate category. The results of descriptive statistics show that the average VO2Max post-test is smaller than the pre-test, which is 36.8 compared to 41.1. The results of the t-test showed that there was a significant difference between VO2Max before and after late night sleep (p value = 0.021). These results showed that the VO2Max before and after the intervention (late night sleep) was statistically significantly different.

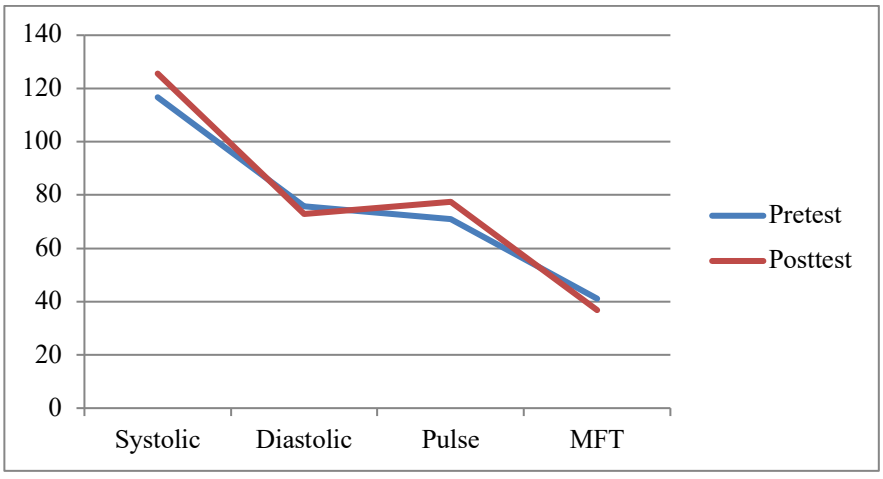

Figure 1. Average Pre-Post Treatment

The results of this study showed that late night sleep patterns caused significant changes in the physical physiological response of athletes. As mentioned earlier, sleep deprivation can significantly affect human physiological abilities. The results showed that sleep deprivation for three days lowered the VO2Max value which describes the athlete's VO2Max decreases. There are several studies conducted on the impact of sleep deprivation on the VO2Max response (Kazemizadeh & Behpour, 2021).

These results are in line with the results of research from (Patrick et al., 2017) that students who stay up late can have a significant effect on blood pressure and exercise performance (reaction time). The quality and duration of sleep can affect cellular immunity and cytokine levels, so a person's immunity can be compromised even with a light lack of sleep. Sleep disorders are also associated with metabolic changes, increased calorie intake, and obesity (Broussard & Cauter, 2016). Sleep difficulties that are quite serious are often experienced by several people, one of which is adults. The aging process is also one of the reasons adults have trouble sleeping. Complications of poor sleep will be experienced when a person is an adult, this causes unbalanced health, often feels pain, and experiences dependence on drugs. Sleep difficulties are also experienced by teenagers where sleep hours are late and then wake up early in the morning. Everyone's sleep hours are different, irregular sleep schedules are often caused by poor environmental conditions. One of the factors that affect sleep quality is physical activity, where physical activity or exercise can trigger a person to feel tired so that they need sleep. The benefit of physical training before bed is to make you tired so that the body will cool down and as a result relaxation will increase. Engaging in fun activities or work can help a person get a good night's sleep (Rezki Maghfirah et al., 2024).

Various negative effects will arise when a person is sleep deprived. Physical fitness has a relationship that shows a low correlation coefficient with sleep quality, so paying attention to sleep patterns is the same as maintaining a fit condition in the body, but not only maintaining sleep quality can maintain a person's physical fitness, other supporting factors such as exercise to other activities that can support physical fitness (Safaringga & Herpandika, 2018). The physical fitness possessed by each individual is different, this depends on how the individual performs physical activity. The development of everyone's physical fitness through a sports activity that aims to increase immunity and physical condition. Unmaintained sleep quality will have negative effects

on the health of the body (Iqbal, 2017). A teenager who practices good quality sleep and regularly will have a better level of physical fitness. Internal factors that can affect student learning outcomes are body health in the form of disorders of bodily functions and nutritional and psychological intake in the student itself, such as self-concept, locus of control, and intrinsic motivation (Faught et al., 2017).

CONCLUSION

The results of the study indicate that late-night sleeping patterns have an impact on the decline in fitness of Unmuh Jember futsal athletes. The body responds by increasing systolic, diastolic and heart rate as a compensatory mechanism. Therefore, it is recommended to athletes and coaches to prevent athletes from sleeping late at night both before the competition and on a daily basis. This study has several limitations, namely the absence of a control group due to a lack of research subjects and only delaying sleep time at night, i.e. sleeping after midnight. Another limitation is that the researchers did not condition the research subjects. Recommendations for further research may include adding a control group and conditioning the research subjects, such as with actigraphy.

ACKNOWLEDGMENTS

Thank you to LPPM Universitas Muhammadiyah Jember which assists Research funds in accordance with Research contract Number: 609/II.3.AU/LPPM/Riset/2023. Also to students who are members of UKM Futsal Unmuh Jember who are willing to be the subject of research.

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